

**Career-Technical Credit Transfer (CT)<sup>2</sup>  
 Mechanical Engineering Technology Career-Technical Assurance Guide (CTAG)  
 August 16, 2019**

The following courses, indicated by a Career-Technical Articulation Number (CTAN), are eligible for transfer among (CT)<sup>2</sup> approved courses and state institutions of higher education.

<b>CTMET004 Manufacturing Processes (TAG course OET010)</b>	<b>Credits: 3 Semester Hours</b>
<p><b>Advising Notes:</b> Students may access post-secondary credit for this CTAN by completing the following:</p> <ul style="list-style-type: none"> <li>• Successfully complete ODE course Manufacturing Operations (175003).</li> <li>• Matriculate to an institution of higher education with an approved or comparable course no later than 3 years after completing the approved secondary program.</li> <li>• Earn a passing score on the end of course exam. The score will be determined at the conclusion of field-testing at the end of the 2019-2020 academic year.</li> </ul>	<p>Secondary institutions must have pathway approval from the Ohio Department of Education. Certificate of Affirmation assurances are now incorporated into the CTE-26 application process.</p>
<b>CTMET005 Computer Aided Design/Drafting</b>	<b>Credits: 3 Hours</b>
<p><b>Advising Notes:</b> In order to access post-secondary college credit for this CTAN, students must:</p> <ul style="list-style-type: none"> <li>• Matriculate to an institution of higher education with an approved or comparable program within 3 years of completing the approved program.</li> <li>• Successfully complete the <b><u>ODE course Computer Integrated Manufacturing (175006)</u></b> from an approved program and earn a qualifying score of 60 or higher on the end-of-course examination.</li> </ul> <p><b>TAG course OET012</b></p>	<p>Secondary institutions must have pathway approval from the Ohio Department of Education. Certificate of Affirmation assurances are now incorporated into the CTE-26 application process.</p>
<b>CTMET006 CNC Programming/Machining</b>	<b>Credits: 3 Semester Hour</b>
<p><b>Advising Notes:</b> Students may access post-secondary credit for this CTAN by completing the following:</p> <ul style="list-style-type: none"> <li>• Successfully complete ODE course CNC (176007).</li> <li>• Matriculate to an institution of higher education with an approved or comparable course no later than 3 years after completing the approved secondary program.</li> <li>• Earn a passing score on the end of course exam. The score will be determined at the conclusion of field-testing at the end of the 2019-2020 academic year.</li> </ul>	<p>Secondary institutions must have pathway approval from the Ohio Department of Education. Certificate of Affirmation assurances are now incorporated into the CTE-26 application process.</p>

The CTAN identifies learning outcomes that are equivalent or common in introductory technical courses. For students to receive credit under these agreements, the career-technical secondary programs and the post-secondary institutions must document that their course content matches the learning outcomes in the CTAN.

### Requirements and Credit Conditions:

1. The receiving institution must have a comparable program, major, or courses that have been approved through submission to the Ohio Department of Higher Education (CT)<sup>2</sup> approval process for the CTANs listed in this document.
2. Credits apply to courses in the specified technical area at Ohio's public institutions of higher education, if the institution offers courses in the specific technical area. In the absence of an equivalent course, and when the institution offers the technical program, the receiving institution will guarantee to grant and apply an equivalent credit value of the Career-Technical Articulation Number (CTAN) toward the technical requirements of the specific degree/certificate program.
3. The applicant must provide proof to the receiving institution that she/he completed a course that has been approved through the (CT)<sup>2</sup> approval process and that she/he has passed the end-of-program assessment.
4. A career-technical student seeking credit under the terms of this CTAG must apply and be accepted to the college within three years of completing a career-technical education program.
5. A career-technical student who meets all eligibility criteria will receive the credit hour value for the comparable courses as offered at the receiving state institution of higher education.
6. The admission requirements of individual institutions and/or programs are unaffected by the implementation of (CT)<sup>2</sup> outcomes.
7. The transfer of credit, through this CTAG, will not exempt a student from the residency requirements at the receiving institution.

Public secondary career-technical students must complete a CTAN in the Engineering and Science Technology and Manufacturing Technology pathway to be eligible for credit under this CTAG. This pathway is outlined in the Ohio Department of Education's *Engineering and Science Technology and Manufacturing Career Field Technical Content Standards*.

### CTMET004 (OET010) Manufacturing Processes

| Credits: 3 Semester Hour

**General Course Description:** The focus of this course is to provide the student with an introduction to common major manufacturing processes. Students will study and gain practical experience in various manufacturing processes such as metrology, materials, heat-treating, machine operations, metal forming, extrusions, castings, welding, finishing, adhesion, fasteners, assembly, and applications of empirical data to determine speeds and feeds to optimize production efficiencies. Learning outcomes are achieved through various in-class and laboratory experiences.

**Credits:** 3 Semester Hours

### Learning Outcomes:

Outcomes marked with an asterisk are essential and must be included in the course.

1. \*Demonstrate an understanding of the interrelationships between material properties and manufacturing processes.
2. \*Distinguish between different manufacturing processes such as forgings, extrusions, castings, forming, and finishing.
3. \*Distinguish between different fabrication processes such as welding fasteners, and adhesives.
4. \*Apply process parameters to optimize production efficiencies.
5. \*Demonstrate appropriate safety procedures and methods in a manufacturing setting.
6. \*Demonstrate proficiency in the use of measurement instruments.

**CTMET005 CADD Computer Aided Drafting/Design (OET012)****Credits: 3 Semester Hours**

**General Course Description:** This course introduces the student to the fundamental concepts used in creating computer-generated drawings using a commercial CAD software. Topics include coordinate systems, construction, text insertion, editing techniques, views, projections, display control inquiry techniques, dimensioning and use of part libraries in the creating of drawings and assemblies. Bill of materials will be generated from multi-sheet assemblies. Students will develop 3D objects using primitive solids and Boolean operations. Learning outcomes are achieved through various in class and laboratory experiences.

**Learning Outcomes:**

1. \* Demonstrate proficiency of a commercial CAD system based on ASME (ANSI) Y14.5 or equivalent ISO standards.
2. \*Create working drawings using orthographic projections, section views, and auxiliary views.
3. \*Create detail drawings that include dimensions and tolerances.
4. \*Create assembly drawings including bill of materials.
5. \*Demonstrate a basic knowledge of 3D modeling.

***\*Asterisk Indicates Essential Learning Outcomes***

**CTMET006 CNC Programming/Machining****Credits: 3 Semester Hour**

**General Course Description:** This course introduces students to the fundamentals of manual programming for numerical control machines. Topics include CNC machine types, controls, safety, and coordinate measuring systems; speed and feed calculations; CNC tooling and fixturing; and programming CNC mills and lathes. Embedded CNC software is utilized for this course.

**Credits:** 3 Semester Hours

**Learning Outcomes:**

Outcomes marked with an asterisk are essential and must be included in the course.

1. \*Explain and apply common formats and codes for manual programming.
2. \*Create a manual CNC program.
3. \*Explain and document setup procedures for CNC lathes and mills.
4. Troubleshoot a manual CNC program.
5. \*Perform set-up procedures on a CNC machine.
6. \*Make the part to print specifications.
7. Explain secondary manual programming techniques.
8. Explain and demonstrate height compensation, cutter compensation, and tooling offset.

Mechanical Engineering Technology Faculty Participation

Steven Sykes	Edison State Community College	Lead Expert
Ramona Anand	Lorain County Community College	Item Writer
Dave Barth	Edison State Community College	Exam Validator
John Hittepole	Edison State Community College	Exam Validator
Scott Laslo	Columbus State Community College	Item Writer
Robert Speckert	Miami University	Item Writer
Dan Wagner	North Central State College	Exam Validator